DOCUMENT RESUME

ED 474 719 SE 067 670

AUTHOR	Taylor, Peter Charles; Zulmira de F. Afonso, Emilia
TITLE	What Is Mozambican Chemistry? An Autoethnographic Inquiry.
PUB DATE	2003-03-23
NOTE	17p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (Philadelphia, PA, March 23-26, 2003).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	*Chemistry; *Cultural Context; Curriculum Development; Educational Change; Foreign Countries; Science Instruction; *Science Teachers; Secondary Education; *Teacher Education Curriculum
IDENTIFIERS	*Mozambique

ABSTRACT

This study was designed to contribute to the development of science teacher education grounded in a Mozambican context. How well the university system prepares science teachers to teach in a Mozambican context was examined by adopting an auto-ethnographic research approach. (KHR)

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what is Mozambican chemistry?

an autoethnographic inquiry

Peter Charles Taylor
Curtin University of Technology
Australia

&

Emilia Zulmira de F. Afonso
Universidade Pedagogica
Mozambique

Paper presented at the annual meeting of the National Association for Research in Science Teaching (NARST), Philadelphia, PA, March 2003

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what is Mozambican chemistry?
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Peter Charles Taylor & Emilia Zulmira de F. Afonso

Introduction

Emilia is a science teacher educator at Universidade Pedagogica (Pedagogical University), Mozambique. In 2000, she enrolled in a Master of Science (Science Education) degree program at Curtin University of Technology. After completing coursework, in 2001 she commenced a one-year research project under Peter's mentorship. In her project report Emilia speaks (English is her 3rd language) about the underlying problem that framed her research study.

> *In 1986, I completed my course at the Faculty of Education, and then I was a teacher. One of those many people who had responded to the need for professional teachers in Mozambique post-independence. One of those many people who had obeyed the needs of the country according to the government program and perspectives. I was not a hero. I was a number, only, within ten, a hundred or maybe a million other numbers recorded in the program of the government. Yes, a number!*
>
> *I took some time to realize that I was dealing with people, that I was there not only to teach, but also to help students learn the content. After some time, my students and I started to better understand each other. They knew that I had been selected as a number due to the political and social realities of that time. I understood that it was difficult for them to learn chemistry without laboratories like those I had in my course at the Faculty of Education, especially without models which I used to see at the Faculty of Education; and sometimes without a piece of chalk to write on the blackboard. From my own experience as a student, I knew that chemistry was strange for most of the students. Chemistry was about industrialized countries. It was not related to our life in Mozambique. No, it was not.*
>
> *I started to enjoy being with my students. We developed a kind of solidarity. I started to be motivated in teaching and to see my students not as numbers sorted to fill in the lists of the classes. They were people, my students, with their language limitations, with their beliefs, with their curiosity about chemistry and their everyday life. In my classes, there were 200 people, after all, struggling to 'cross the border' between their everyday life and their chemistry classes. At that time I did not, in fact, recognize this border or the process of border crossing (www.usak.ca/education/people/aikenhead/RSTE.htm). Did I, as a teacher, cross the border smoothly or violently? On what side was I located if I was a native Mozambican teaching that strange knowledge grounded in a Western cultural view of the world? How did those two worlds define the kind of teaching I was doing?*
> *In 1992, I took up further studies at the Universidade Pedagogica and in*

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1994, my last year of 'Licenciatura', I undertook a research project. When I was administering the questionnaires, a question raised by a student in Year 10 held my attention. She was responding to an open question about what the students would like to know about historic facts in chemistry. She wrote that she already knew something about American and European chemistry but that she would like to know about chemistry in Mozambique. She wrote: "What is Mozambican chemistry?"

Mozambique is a southern African country, which had been under Portuguese colonization for five centuries. In 1975, Mozambique achieved its political independence. Since then, the country has suffered from crises of human resources derived from the fact that most of the trained people in several areas, the majority being Portuguese, abandoned the country. To counter the brain drain in different areas, short and intensive courses were designed. Education was one of the areas facing a lack of trained people. One of the priorities decreed by the Mozambican government was to prepare teachers. The Faculty of Education was devoted to offering short and intensive courses for teachers. In terms of human and material resources, the Faculty had depended on other countries. For example, most of the lecturers were foreigners and the laboratories were equipped by donations from other countries. Thus the curricula, both in teacher education and secondary education, were framed by the standards and experience of other countries.

In 1989, the Faculty of Education was closed and replaced by the Universidade Pedagogica. However, in this new institution economic and human resource crises remained, and the main features of the curriculum remained almost unaltered as well.

(Afonso, 2002, pp.6-8)

Aim of the study

This study was designed to contribute to the development of science teacher education grounded in a Mozambican context. Emilia wanted to examine how well the Universidade Pedagogica prepares science teachers to teach in a Mozambican context. She adopted an 'autoethnographic' research approach (Ellis ref), similar in epistemological style to a study conducted by Joe Timothy, a science teacher educator from Vanuatu (Timothy, 2000; Taylor & Timothy, 2000) and an earlier graduate of Peter's research program. Congruent with this epistemology, Emilia focused on her own lifeworld experiences, particularly her current teaching of 'Didactica de Quimica' (Teaching Chemistry), as the main context of the study.

Significance

Similar to action research, this self-study is significant first and foremost for Emilia's own practice as both a science teacher educator and a potential change agent in her own institution. Autobiographies, as Brookfield (1995) argues, are one of the valuable lenses through which we can examine our teaching.

> *It is my hope that the narratives in this research will provide an opportunity for me to grow as a teacher educator. It is my hope that the reflective act in which I am willing to be engaged will be an opportunity for me to learn from my experience.* *(Afonso, 2002, p.10)*

The study has a national significance inasmuch as the government of Mozambique is keen to transform the science curricula of primary and secondary schools to better meet the emergent needs of postcolonial (and post-independence) Mozambique.

> *I hope also that this research will cultivate in my colleagues, teacher educators and science teachers, 'pedagogical thoughtfulness' and support them in the reconciliation of science (strange, foreign and still important knowledge) and our society. Indeed I hope that this will be a contribution for we Mozambicans, to develop a personality imbibed in our cultural and social realities, and that this personality will enable us to "assimilate critically the ideas and experiences of other peoples, and also passing on to them the fruits of our thoughts and practice" (President Samora Machel, cited in Gerdes, 2001), in other words, to make science a medium for critical literacy.* *(Afonso, 2002, pp.10-11)*

The significance of the study lies also in the autoethnographic research approach which was adopted as a means of enriching science teacher professional development. Although self-study might, at first glance, appear highly idiosyncratic with little generalisability, Roth (2000) argues that autobiography is also 'otobiography', because 'oto' (ear) is important as we write for others, for the reader. We write and we tell others our legitimate thoughts and experiences without subjecting them to second interpretations. Eisenhart (2000) states that this is a "valuable and straightforward" method for obtaining a genuine account of an issue as it brings out the personal view, without subjecting it to others' interpretation and representation. As Burdell and Swadener (1999) say, the use of personal narratives is one response to a "colonizing or 'othering' discourse" (p.22), the discourse in which one's story is written (understood, interpreted and represented) by another person. Thus, the methodology adopted here constitutes an approach to bring Emilia's own cultural context to science teacher professional development.

Theoretical underpinnings

The research is related closely to recent (late postmodern) theories of teacher professional development that seek to broaden curricula beyond traditional concepts of *content* and *reproduction* which tend to disempower teachers by rendering them unreflective and compliant consumers and reproducers of (Western) academic knowledge. Hargreaves (1994) argued that "in the United States, the tendency is to treat and train teachers more like recovering alcoholics: subjecting them to step-by-step programs of effective instruction or conflict management or professional growth, in ways which make them overly dependent on pseudo-scientific expertise developed and imposed by others" (p.xiv). The contribution of tertiary institutions and formal courses will be of little value unless "they connect to the teacher's classroom and school experience in meaningful and extended ways" (Northfield, 1998, p.705).

In recent years, in his role as a science teacher educator at Curtin, Peter has been developing a 'transformative' pedagogy of professional development which connects deeply with science teachers' lived experiences and engages them in reflecting on, re-visioning and re-constructing their identities (as both learners and teachers). Amongst his 2001 science education research project unit, several African students chose to embrace, to varying degrees, transformative images of curriculum (Shubert, 1983) - *as experience, as currere, as social reconstruction* - which were being offered as a means of transcending (or counter-balancing) the restrictive *content* and *reproduction* metaphors of curriculum that had been shaping much of their preceeding coursework. Emilia chose to embrace all three curriculum images by adopting an epistemology of research - critical autoethnography - in which she explored, within the context of her own (rapidly evolving) cultural milieu, her multiple and fluid identities as learner, science teacher, science educator and cultural 'border crosser' (Aikenhead, 2000).

Epistemology of the Research

The epistemology of this research does not rely on positivism. Emilia holds very few rules of positivism; a posture that underlies the philosophy of the methodology of this research. The study constitutes a dialogical form of research, in which the researcher does not expect to be offering an end result, in the form of confirmed or disconfirmed hypotheses, or an objective Truth. Instead, it presents multiple subjective perceptions to the reader, expecting that the text will "resonate with the experience of readers while, at the same time, evoking a critical reflexivity about their own pedagogical actions" (Geelan & Taylor,2001).

In this paper we present parts of Emilia's 'native' autoethnography which contextualises a problem imbibed in a history of colonialism and economic subordination (Ellis & Bochner, 2000). Autoethnography is an autobiographical genre of writing and research that displays multiple layers of consciousness, connecting the personal to the cultural (Ellis & Bochner, 2000, p.739). This research approach highlights the interpretive scope of the writer, and interweaves factual recall, (re)interpretation and critical reflexivity. Personal narratives are constructed and scrutinized (perhaps deconstructed) from a contemporary perspective that is always unfolding in the moment of writing, assisted by the simultaneous reading of new literature.

This autoethnography constitutes research in two ways: (i) writing as research and (ii) reading as research. For Emilia, writing constituted research in a way that, while writing her stories, she exposed and reflected on her own practice of teaching and learning whilst absorbed in the broader context of teaching in Mozambique. This research constituted a journey of discovering about objectivities and subjectivities, about issues on which Emilia's own practice had been grounded. As Richardson (2000) says, writing is a method of 'knowing'. It served Emilia as a method of inquiry, a means of discovering about her topic and herself.

Reading also constitutes research inasmuch as Emilia's intention when writing was not only to expose events but also to focus on the potential consequences for readers of her stories. As an 'otoethnography' (Roth, 2000), the "usefulness of the stories are their capacity to inspire conversation from the point of view of the readers, who enter from the perspective of their own lives" (Ellis & Bochner, 2000, p.748). Emilia intended that when the reader reads her stories, he/she will also learn something, will find out something about him/herself or about his/her topic or others' topics, will inquire into his/her or others' professional practice; thus, reading constitutes an act of discovering -

a method of research.

Validity

> *To ask about validity in this research means to ask how it may be transferable to the readers. In other words, a key criterion of validity is 'transferability'. Lincoln and Guba (1998) refer to transferability in terms of how the hypothesis in a certain context can be applicable to a different context. However, in this research, transferability means, first, how the stories narrated might invoke 'pedagogical thoughtfulness' in other science teachers and teacher educators in the same context (i.e., my colleagues at Universidade Pedagogica, and teachers at secondary schoo[1]). And, second, transferability means how the stories narrated might make sense to different readers in different contexts; make sense but not necessarily be applicable. As Altheide and Johnson (1998) state, validity may be different for different audiences.* (Afonso, 2002, p.16)

The validity of these narratives lies in large part in 'the eye of the beholder'; in their verisimilitude (do they seem real?) and in the extent to which they engage the reader in pedagogical thoughtfulness (do they move me toward thoughtful action?). However, Emilia also took steps to build trustworthiness for the reader by remaining reflexively aware of the limited scope of her understanding of Mozambican science teacher education and by trying to avoid a narcissistic self-indulgent and self-centered personality (Hargreaves & Earl, 2002).

> *My experience, my worries, happiness, disillusions, hopes, in short, my weaknesses and my strengths are the subject of my reflections. Even so, I do not take myself as a supreme, unquestionable person in conveying knowledge regarding teaching in Mozambique or wherever else. I take myself as one of the individuals in that social context; giving my account about my experience to share it with others, and to invoke reflections about their own practices.* (Afonso, 2002, p.15)

Another key ethnographic strategy for achieving trustworthiness was the adoption of 'polyvocality' (Gergen & Gergen, 2000). At times, Emilia's voice speaks within the moment of writing, as a researcher; at other times her voice speaks her thoughts at the historical moment of the specific event being narrated, 'undressed' of retrospective experiential reflection. Invited colleagues, who had lived in a similar context of colonialism and economic subordination, wrote some of the narratives. Amongst them are those who were either aware or unaware of this research.

The Narratives

Emilia began by writing critical autobiographical stories about her experience as a student at primary school in the 1970s, gradually shifting the focus of her writing across time, moving through high school, the transition to science teaching, and then the period when she became a science teacher educator. Her writing was stimulated by conversations in class with Peter and with fellow African students, with visitors, especially Glen Aikenhead, and by readings Peter brought back from the 'Culture,

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Language And Gender Forum' in Japan, coordinated by Masakata Ogawa.

Each set of narratives comprises one or more stories set in a particular historical period, connected together with interpretive (scholarly) commentary. The first four sets of narratives - 'School is Useless!', 'The Education List', 'Teaching at Manyanga', 'Universidade Pedagogica: Going Away from Myself' - illustrate richly the many ways in which 'decontextualised' science learning, teaching and teacher education have been imbibed historically (as though natural and inevitable) in the practices/policies/resources of formal science education in Mozambique. For this paper, we have included a sample of Emilia's stories and, in order to restore coherence, which is inevitably lost in the sampling process, we have arranged the stories under themes, commencing with 'On being at school'..

On being at school

Emilia chose an episode involving one of her former colleagues to begin the narratives. The episode brings up some cultural and social conflicts among students in a primary school situated in a rural area. The story is based on an encounter between two different worlds, and portrays a struggle between different sets of cultural values, each of which is claiming absolute authority and ownership of the Truth in children's minds.

School is Useless

It was during 1974 that I was sent to school in Mozambique. I was 7 years old. Although it was my first year at school, I did not attend Year One. Instead I was attending Year Two because the teacher said that my knowledge was good enough to be in Year Two. Actually, I do not believe that it was better than others in Year One, but the fact was that unlike many kids there, I was a reasonably good Portuguese speaker. And Portuguese was the unique language used to communicate in class.

My school was one of the best schools in the district of Panda-the school where assimilated people used to go. Even so, the majority of the pupils were non-assimilated, as they were the majority of the population in Panda. Panda is one of 110 districts that constitute Mozambique. It is in the southern province of Inhambane, the land that new Portuguese arrivals called "the land of good people", due to the friendly welcome they received from the inhabitants.

At that time, Mozambique was still considered to be a province of Portugal. At school we were taught about the courage and bravery of Vasco da Gama and Luis de Camoes. We learnt about the princes and princesses of Portugal. We learnt about important rivers in Portugal and many marvelous things about Portugal: the food, the drink, the people... We learnt the word "oliveiras", for the trees that produce olive oil, "famous in the entire world", my teacher said. We learnt the word "videiras" for the vines that produce grapes used to produce wine. We learnt about God, whom I understood to be a white man, and the devil, whom I understood to be a black man. We learnt how big Portugal was, how it extended from Europe to Africa. We learnt about the weather in

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Portugal and how it was important that the Portuguese came to my country to save our souls "that before were lost" (Gomez de Azurara, in Ferris, 1989).

One morning during a break, Joao, an assimilated 8 year old pupil, asked Julia, a non-assimilated girl, if she knew what olive oil was. Before she answered, he laughed, saying that he was sure that she did not know and had never eaten something prepared with olive oil. Some of my other school friends laughed, even though eventually it was clear that they too did not know what olive oil was. Other children were sympathetic and remained quiet. Julia was older than many of us in Year 2. She had failed twice and the teacher, originally from Portugal, had commented that she would never pass unless she improved her Portuguese, the language used in the school. Looking at Joao, Julia said, "I am not worried about that. I don't know what olive oil is, but I know how to prepare "mafurra" oil and I know how to cook a good peanut flour curry. My mum says it is very healthy. My mum says that when I grow up, I won't need all these schoolbooks in my life. I will only need to be able to go to the fountain to get water for my home. She says I will only need to know when to plant peanuts and vegetables, and to understand the language of the birds and the wind when they are telling us when will it rain and when the monkeys are nearby to steal my corn." I looked at her and I did know how to react, but I felt a little embarrassed. She continued "My mum said better understand the language of the birds than to understand Portuguese. My mum says school is useless; I am here just because she does not want trouble with the authorities. School is useless to my life!"

Joao ran to the teacher and told her about Julia. Julia was taken and the teacher hit her with a big wooden ruler-so that "she could think right."

(Afonso, 2000, pp. 21-22)

Jegede and Aikenhead refer to Phelan et al.'s proposal of four categories of pupil, namely (i) potential scientists, (ii) other smart kids, (iii) I don't know students and (iv) outsider students (<http://www.usask.ca/education/people/aikenhead/RSTE.htm>). Was Julia an outsider student (the one whose transitions between cultural context and school context are virtually impossible because the cultures are highly discordant)? Or was it, as the teacher said, just a matter of knowing the Portuguese language?

Reflecting on this episode while reading government documents (e.g., Estatutos e programa do partido FRELIMO, 1983, Documentos do 3^{0} congresso), Emilia interrogated the meaning of the country's independence for Education: *"Did it mean that at school we would be learning science, for example, in our cultural, economic and territorial context?"* (Afonso, 2000, p.23). In looking for an answer to this question, Emilia referred to the literature (e.g., Linha, Palme, & Xerinda, 1997; Instituto Nacional de Desenvolvimento de Educacao, 1999) which argues about a gap between society and teaching and learning, a gap that exists in both curricula and textbooks in use in Mozambican schools.

On being selected for science teacher training

Willis (1999), who argues about the importance of reflective practice, identified three modes of reflection, namely: (1) contextual reflection in which the practitioner thinks about the cultural and social circumstance that frame his or her activity, (2) dispositional reflection in which the practitioner goes back in time and thinks about his/her own predispositions towards his/her profession, and (3) experiential reflection in which the practitioner reflects on events that have occurred and sees them as an experience of her practice.

In writing her stories, Emilia adopted all three types of reflection without, however, making distinct boundaries between them. For example, in writing the following story, she reflected mainly on her dispositions and social circumstances when she became a student teacher.

The Education List

In 1978, at age 11 years, I moved to the capital city, Maputo, and I completed Year 12 in 1984. I had vague memories of chemistry, biology and physics. Chemistry was a rubble of formulas, only valid for the tests and the exams. Physics-oh physics was just boring. Yes, for my everyday life they seemed useless, as useless as Julia said school was for her. However, this was the way to achieve a university degree and then to get a good job.

I wanted to take an agriculture course so that I could better understand how plants grow. Agriculture was for me an amazing thing. I wanted to understand the relationship between the soil, the wind, the rain, the sun and the people who grew cassava, sweet potatoes, corn and beans. Then I could go to my parents, do something useful for them and say, "Yes, school was useful." I wanted to help them produce a huge machamba that would make them proud of me. I was anxious to learn something practical, something that even my grandparents would admire me for and would ask me about techniques to improve the production of cashew nuts. Yes, agriculture seemed to me everything: my family, my school and my job-my pleasure and my spiritual and material wealth.

That was a special day in February 1985. The day in which the lists were to be published on the boards at the then only university in Mozambique, the Universidade Eduardo Mondlane. Before the semester started we were asked to fill in a form on which we could write our course preferences. However, there was no guarantee that we would get our preferences. In fact, we had to wait for the lists to find out which course we would be enrolled in.

The education list was regard as the sad list; the worst of the lists, especially if compared with medicine, agriculture and engineering. I was not an exception, so I hated the education list as well.

I looked for my name on the list for the Agriculture course but it was not there. I felt a bit disappointed. I looked at Medicine and then at Engineering. No, my name was not on any of the Science lists. I then went to look for my name on the finance list. No it was not there. Then I said to Joana, my former classmate that my name was not on any of the lists. "Any?" she asked, and I said, "Any!". "Did you look at the Education list?", she insisted. And I said, "No...". I said to myself, "My name cannot be there!" However, the Education list was the only one that I hadn't looked at, so I went there.

My goodness, my name is there! My name is on the list for Chemistry and Biology teachers.

Why is my name on such a list? I don't want to be a teacher. I do not want to be teaching boring and useless things at school. Why me? I thought I did well at school. What are the criteria for compiling these lists? Are they based on marks, age-what? I want them to tell me what the criteria are. They have made a mistake; I will never be a teacher. I will never be teaching boring and useless things. They are joking. Me, a Chemistry/Biology teacher? Never, never! I will find a way to get out of it. I will find a way.

I have to disappear. I do not want to see their faces. I want to run out and I want to cry. I have to go home.

(Afonso, 2002, pp.25-26)

Nonetheless, Emilia took up the course, which she finished in 1986. In 1987 she began her career as a science teacher in a secondary school in Maputo, and adopted (she later recognized) the kind of teaching that overlooks students and emphasizes content, an approach she had experienced in her own primary, secondary and university studies.

There are more than 200 pupils under my tutelage. They are meant to be taught Year 11 chemistry (...) but more that that, there is a lot of content to be taught. There are seven chapters in the Year 11curriculum. This is my main concern, the content! *(Afonso, 2000, p.35).*

On doing further studies in science teaching

After some years, Emilia started to love her profession and decided to take further studies in education. In the next story, Emilia draws on her second student teacher education experience and adopts a critical perspective on some of the strategies and policies at Universidade Pedagogica that she had found were ignoring students' own experiences and restraining their creativity.

Universidade Pedagogica: Going Away From Myself

In 1992, I started a research project as a complementary part of my Licenciatura course. I had a vague idea about what I would like to do, it was not yet well defined. However, I soon realized that I would not have to

think about the topic of my project because there were already topics that our lecturers thought were worth researching. The list of topics was on the student notice board. I went there with Carla. There were about 10 topics but only two were still available. All others were already taken by other students. "You take that one and I'll take this one", I suggested to Carla. She agreed and so I had my topic: 'Historic facts in teaching chemistry'.

"What does it mean?", Cristina asked me. "I'm not sure but I will have to know soon. This is ***my*** *topic!", I replied.*

Dr Hans explained to me what "historic facts" were. He emphasised that I was not supposed to search for new historic facts. Historic facts were those already discovered long ago-by scientists like Lomonossov, Mendeleev, Bohr and Arrhenius. And, of course, I was not meant to include my thoughts regarding Years 11 and 12. The priority was to prepare teachers for Years 8 to 10!

The paradox is that, while my intention is to improve what I am, a teacher of Years 11 to 12, I need to focus on what I am not, a teacher of Years 8 to 10. It is not that I see no value in teaching Years 8 to 10; it's just that I am already teaching Years 11 to 12 and so I would like to be allowed to learn about teaching that level!

I embraced all these historic facts and I pretended to be a teacher of Years 8 to 10, a teacher who knew nothing about Years 11 and 12. I abandoned my classes, my students and my learning environment at Manyanga. To do further studies in education, I threw away my real professional practice!

(Afonso, 2002, pp.47-48)

Northfield (1998) says that the contribution of tertiary institutions will be of a little value unless "they connect to the teacher's classroom and school experiences in meaningful and extended ways" (p.705). Writing this story was one of the episodes that caused Emilia to interrogate herself; as she is now educating other teachers she posed herself the question: *"How much have I encouraged my students to reflect upon their own practices as students and as teachers?" (Emilia, 2000, p.33).*

On being a science teacher educator

The power of Emilia's early narratives enables the reader to experience vicariously the culturally alien (and alienating impact of) imported (Western) contexts which, after a life time of exposure, left Emilia powerless to intercede in her new role as a science teacher educator at Universidade Pedagogica. She felt unprepared to create a Mozambican chemistry education.

However, in the final two sets of narratives - 'Listening to Different Voices', 'Now I Become Myself' - Emilia recounts the impact of her thinking about contemporary conversations and arrives at a resolution to the paradoxes she (re)encountered during her year-long autoethnographic journey. Here is one of the stories from this closing set of narratives.

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Renegotiating different worlds

As an African science teacher, the big paradox in my profession is to understand and get involved with science but at the same time allow my own cultural personality to govern my thoughts and my life. I mean to "... honour the 'little' stories of the students [and mine] and the 'big' stories of the disciplines and tradition" (Palmer, 1998, p.74).

I refer to my conversation with Glen Aikenhead and Peter. Maybe the way to hold this paradox is by making clear those different worlds and assuming different roles in accordance with the different situations. Playing the role. As a teacher, my challenge should thus be to allow all these personalities to live in me without conflict - to understand science but not necessarily believe in it and to understand my culture, in which I have strong beliefs. Rather than seeing them as conflicting, allow them both to be in my inner self and so become able to play the outer role. Not requiring my students to engage in 'concept-replacement' - "replacing common sense concepts they have constructed or learned from others" (Aikenhead 2000), but rather promoting 'concept-proliferation' – not allowing students to throw away their common sense views in favour of the (Western) science view.

Once I had discerned this perspective, I gained a certain inner peace. I remembered my grandmother who used to say that by going to school we would get lost. This concept of getting or being lost is interesting to me. Early in this research I quoted Azurrara (1989) who refers to our (African) soul, before the whites reached Africa, as being lost. My grandmother had a completely contrary view about what it was to "get lost". I can still remember her eyes filled with uncertainty and fear - but also with hope. She loved us and she was visibly concerned about our future. She was, though, not sure if the best thing for us would be going to school or remaining tied to our traditional customs. I could see doubt in her eyes, and sadness. Playing the role and promoting concept proliferation seems to allow me to get involved with Science but, at the same time, also allows me not to lose or hide my culture. It means not "getting lost".

(Afonso, 2002, pp.59-60)

These are some of the strategies Emilia discerned to renegotiate the different worlds in which she lives.

On revisiting the question "What is Mozambican Chemistry?"

Nearing the end of her autoethnographic project, Emilia revisited the question that had inspired her study.

In looking for an answer to the main question - <u>What is a Mozambican</u>

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chemistry? - I came to realize how complicated it is to answer. My reflections about the research question are as follows.

(1) In terms of resources:
Are the resources recommended for teaching Mozambican chemistry available in schools?

This is in my view an important issue to take into consideration... Nonetheless, if I replace those sophisticated materials with the ones we can locally afford, would we then be teaching Mozambican chemistry? I wonder if this satisfies the concern behind the main question? Maybe, even if I replace the resources with locally available ones, chemistry would still be non-Mozambican chemistry ...but it depends on how you look at this question.

(2) In terms of language:
Are problems regarding language (as Portuguese is for most of the students a second language) discussed in Didactica de Quimica's classes?

It is not surprising to find that, in some idioms, there are no words for some technical terms. Even so, suppose we invent and replace these technical words with local-language terms. Does this mean that we would then be teaching Mozambican chemistry? And if we would invent new words, would the meaning be the same as that word translated? Kawasaki (1996) mentions Saussure as arguing, "far from it being the object that antedates the view point, it would seem that it is the viewpoint that creates the object" (p.3). In this sense, how could we be sure that objects created from the science point of view would be coincident with the ones created from, for instance, a culturally Mozambican point of view? In this sense, linguistic translations rather than being facilitating may lead to misconceptions and misunderstanding.

(3) In terms of content:
Are national issues, environmental problems, and traditional customs referred to/discussed? Here, at the end, I would like to add to this question the following: To what extent is it possible to integrate differences in culture in the classroom?

I believe that sometimes we do not have to find agreement among different ways of interpreting nature and the world. "There are two ways [or more?] of knowing; one of them is the traditional way"
(George, http://actionbioscience.org/education/george.html) and, I think if we accept this then there will be enough space in our science classes for different cultures and ways of interpreting the world. I mean, to adopt a dialectical posture, rather than a dualistic posture, when teaching and learning science as an approach of promoting a further inclusive science teaching and learning (Taylor & Willison, 2002)

Emilia concludes by considering strategies for making her own teaching practice more contextualised in the culture of Mozambique; and yet she prefers to leave open to further consideration (her own, others') the paradoxical question which shaped her autoethnographic study: "What is Mozambican chemistry?". Nevertheless, the question is much more informed and our appreciation of the underlying paradox is much more theoretically sophisticated.

> *My latest words are for those who agree that cultural aspects have to be considered in our curricula.*
>
> *In fact how can we, for example, at Universidade Pedagogica, train teachers to be 'cultural brokers' in our schools and, further, what metaphors for curricula should illuminate our educational research? Should it be* curriculum as cultural reproduction*? Should it be* curriculum as cultural reconstruction *(Schubert, 1986)? What should it be?*
>
> *Finally, what did the student in Year 10 mean? Did it mean that we had to include some information about Mozambican factories and industries? Were factories and industries, for her, "Mozambican facts"? Or was it still European or American, just imported to Mozambique? Was she looking for something that was not, for example, $H_2O + O_2$, or the periodic table or the concept of the atom? Or was she just thinking at a level of language, that is, did she mean to simply translate those concepts to her local language? What did she mean?*
>
> *What is Mozambican chemistry? Do you have an answer? Do you think it is just a wrong question? Do you think it is ambiguous and needs more clarification? Do you think it has cultural logic?*
>
> *(Afonso, 2002, p. 64)*

Post-comments from Emilia

Since I started this research, I have learned very much from the things I already knew. In fact, as an autobiographical narrative, the content was from my own lived experience, particularly critical events that I recollected. Writing each set of narratives made me see the events reflexively and from different perspectives. Indeed, relating these events to the literature I was reading and to conversations I was having helped me to better understand where I am coming from and why I am going the way I am. By reflecting critically like this I am continually looking for ways to improve my practice, day after day.

I am now back with my students at Universidade Pedagogica and I have been encouraging my students to learn from themselves. To learn from what they already know. To interrogate their own attitudes and their colleagues' and teachers' attitudes

toward learning and teaching science. To discover hidden subjectivities they have as Africans at school. And they have been telling me, among other things, what they think is Mozambican chemistry, sometimes with no agreement about it in our class.

References

Afonso, E. (2002). *Rethinking science teacher education in Mozambique: An autoethnographic inquiry.* Unpublished dissertation for Master of Science (Science Education) degree of Curtin University of Technology, Perth, Australia. Downloadable at http://pctaylor.com/

Aikenhead, G. (2000). Renegotiating the culture of school science. In R. Millar, J. Leach and J. Osborne (Eds.), *Improving science education* (pp.245-263). Philadelphia: Open University Press.

Brookfield, S.D. (1995). *Becoming a critically reflective teacher.* San Francisco, CA: Jossey Bass.

Burdel, P. & Swadener, B.B. (!999). Critical narrative and authethnography in education: Reflections on a genre. *Educational Researcher, 28*(6), 21-26.

Denzin and Y.S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed.) (pp.733- 768). London: Sage Publications.

Documentos do 3 congresso da FRELIMO, (n.d.) *Programas e estatutos.* Maputo

Eisenhart, M. (2000). Boundaries and selves in the making of 'science'. *Research in Science Education,* (30)1, 43-55.

Ellis. C. & Bochner, A. (2000). Autoethnography, personal narrative, reflexivity. In N.K. Denzin and Y.S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed.). London: Sage Publications.

Geelan, D.R. & Taylor, P.C. (2001).Writing our lived experience: Beyond the (pale) hermeneutic?. *Electronic Journal of Science Education, (5) 4. http://unr.edu/homepage/crowther/ejse/ejsev5n4.html*

George, J. (May, 2001). *Culture and Science: A look from the developing world.* Available http://actionbioscience.org/education/george.html retrieved 1, May, 2002.

Gerdes. P. (2001). On the African renascence and ethnomathematical research. In I.V. Mutumucuio (Ed.), *Promoting regional collaboration in research in mathematics, science and technology education in Southern Africa* (pp 1-14). Maputo: Eduardo Mondlane University Press.

Gergen, M.M. & Gergen, K.J. (2000). Qualitative inquiry. In N.K. Denzin and Y.S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed.) (pp.1025-1046). London: Sage Publications.

Hargreaves, A. & Earl, L. (2002). Perspectives on alternative assessment reform. *American Educational Research Journal, 39*(1), 69-95.

Hargreaves, A. (1994). *Changing teachers, changing times. Teachers' work and culture in the postmodern age.* London: British Library Cataloging-in-Publication Data.

Instituto Nacional de Desenvolvimento da Educacao. (1999). *Projecto de transfromacao curricular do ensino basico.* Maputo: UNESCO.

Jegede, O. J. & Aikenhead, G. S. (n.d.) *Transcending cultural borders: Implications for science teaching.* http://www.usask.ca/education/people/aikenhead/RSTE.htm .

Linha, C., Palme, M., & Xerinda, C. (1997). *O ensino das ciencias naturais e as concepcoes das criancas.* Maputo: INDE.

Northfield, J. (1998). Teacher educators and the practice of science teachers. In B.J. Fraser and K.G Tobin. (Eds.), *International handbook of education* (pp.695-706). London: Kluwer Academic Publishers.

Palmer, P.J. (1998). *The courage to teach.* San Francisco, CA: Jossey-Bass.

Palmer, P.J. (2000). *Let your life speak*. San Francisco, CA: Jossey-Bass.

Partido FRELIMO.(1983). *Estatutos e programas do partidp FRELIMO*. Maputo: Coleccao IV Congresso.

Richardson, L. (2000). Writing. A method of inquiry. In N.K. Denzin and Y.S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed.) (pp.923-947). London: Sage Publications.

Roth, W. (2000). Autobiography and science education: An introduction. *Research in Science Education, 30*(1), 1-12.

Schubert, W.H. (1986). *Curriculum: Perspective, paradigm, and possibility*. New York: Macmillan.

Taylor, P.C. & Willison, J.W. (2002, Jul) *Complementary epistemologies of science teaching: An integral perspective*. Paper presented at 33rd annual conference of the Australian Science Education Research Association, Townsville, Qld.

Willis, P. (1999). Looking for what it's really like: Phenomenology in reflective practice. *Studies In Continuing Education, 21*(1), 91-112.

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Publication Date: 23 March 2003

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Printed Name/Position/Title: DR Peter C. Taylor

Organization/Address: SMEC, Curtin University, GPO Box U1987, Perth, WA, 6845, AUSTRALIA

Telephone: +618 9266 7501

FAX: +618 9266 2503

E-Mail Address: P.Taylor@curtin.edu.au

Date: 5/4/03